

ber 31, 1904, were asked for but not produced. The gas used at the works has been both charged and credited at the arbitrary price of 50 cents per thousand cubic feet, as the charge shows on both sides of your ledger, the unit price is not a matter of great importance; however, the price of 50 cents per thousand which is intermediate between your holder cost and burner cost is a fair price.

The price of gas used in public buildings has been allowed to remain at \$1 per thousand cubic feet for a reason being that when the gas property controlled by a private corporation, they would charge for the gas at this price.

The consumption of gas in street lamps was by actual test of a number of lamps found to be about five cubic feet per hour, instead of eight cubic feet, as shown in your annual reports. The street lighting has thereupon been placed at \$20 per lamp per year, this price again being what the city would have to pay a private corporation for this service. Therefore the city has charged itself for street lighting at the rate of from \$20 to \$100 per lamp per year.

The premiums on the insurance carried on a portion of your property and the settlement of claims for damages have been included in your operating expenses. Attached hereto you will find letters from your City Attorney relating to this matter of settlement of claims. At the present time there is pending a suit for \$1,000 for damages to your cost. However, been included in your cost, such as office rental, items of cost, etc., have been estimated at 2-1/2 cents per thousand cubic feet of gas accounted for.

**Coal Gas Manufacture.**

The chief criticism to be made of your coal gas manufacture cost is that your labor charges are excessively high. With the installation of a heavy machinery your which has for the past three years been in the neighborhood of 20 cents per 1,000 cubic feet, should be reduced to not exceeding 12 cents per 1,000 cubic feet.

The stokers in your retort house, from actual observations, are doing manual labor only from fifteen to twenty minutes in each hour; men employed in this class of work are never expected to work sixty minutes to the hour, but there is no reason why they should not work at least thirty minutes to the hour.

It is now costs you a trifle less than \$2 to unload a gross ton of coal, deliver it to the retort house, charge it in the retort, draw it out as coke, and remove the coke from the retort look over the recently had a retort house having practically the same capacity as yours and actually working under conditions less costly to economy than yours, showing a cost per 1,000 cubic feet for labor of only one-half of your similar cost.

In addition to there being an unnecessary number of men employed in bringing in coal and carry out coke, they would yield an excessive rate of \$2.50 to \$2.50 per day; \$2 per day is ample under the conditions prevailing in Richmond. The conditions of paying high rates for your workmen are given steady employment. It seems strange that any allowance should be made for working on holidays.

The type of coal gas bench is far from modern or efficient, using as it does for retorting of retorts in the neighborhood of thirty per cent. of the total yield.

No attempt is made to recover the ammonia from your coke. By installing proper apparatus and separating coal and water gas the ammonia could be recovered, and should yield from one to two cents per 1,000 cubic feet of coal gas manufactured, depending upon the market for sulphate. There is good reason to believe that this by-product could be found for your coal and water gas.

The gas is sold at the low price of 85 cents per barrel, or 17 cents per gallon. I am advised that you advertised for bids, and that the above named price of 85 cents was the highest received.

The tar from the two gases was separated and delivered to the contractor free from water, you should obtain a considerably higher price.

**Water Gas.**

The analysis of your water gas cost shows a high labor figure, although they are not so excessive as is the case with the coal gas. Your figures for 1902 and 1903 are high; the oil used per 1,000 cubic feet in 1904 would be considered fairly good on the basis of a 25 candle power mixed gas, as there were no means of determining this average candle power. From the observations which have recently been taken it seems extremely doubtful whether the average was up to 20 candle power.

Taking into consideration the use of coke breeze under your holders, records of which have ever been kept, your fuel consumption in water gas manufacture is high.

**Cost Beyond the Holder.**

The portion of your cost other than manufacturing cost and including the items of distributing expense, commercial expense, new business, etc., are low for the simple reason that you do not distribute gas in the common acceptance of the world. You do not meter the gas, set meters, and turn gas onto your system, but voluntarily take no steps to see that the consumer gets the service to which he is entitled. Your repair mains and services only when driven to do so by complaints of leaks or poor service. Your meters are not overhauled until they stop registering, or in some other way show distress.

Although your gross cost in this department is low for the reasons above stated, a number of instances were noted where your net cost was exceedingly high. For example, you pay three times \$3 each day to regulate the valve control.

**The Perfect Beautifier.**

**Blanks' Velvet Lotion**

It is a harmless preparation that completely obliterates all facial blemishes. After a few applications of Velvet Lotion the skin becomes soft, clear and velvety. It contains ingredients that are endorsed by doctors and expert chemists as harmless to the skin and remove freckles, pimples, blackheads, wrinkles, and all skin blemishes.

Price 15c and 25c per bottle.

Prepared and Sold by

**BLANKS,**

The Prescription Druggist,

and

**L. WAGNER DRUG CO.,**

The Toilet and Perfumery Druggist

**"Berry's for Clothes."**



You must have a new Top Coat, because there is such a pronounced change in style this Fall that your old Top Coats "look their part."

They show they're back numbers—good enough for storms but you've got to have a new one just for looks—it for no other reason.

\$12.50 to \$25.00

Hats make or mar a man's appearance.

We only give you the "making" kind here—think so much of our reputation.

\$1.50 to the best—Dunlap.

**On Berry & Co.**  
MEN'S & BOYS' OUTFITTERS

trolling the supply on your distributing system and even with this expenditure the valve is not regulated with any degree of intelligence. This is clearly shown by the pressure charts taken at a number of points.

A considerable saving could be effected in your commercial department by adopting more modern systems of accounting, and by the use of mechanical appliances.

The whole attitude seems diametrically opposite to that of a private corporation. You take the position of doing a favor to the public by supplying service. This is meant as no reflection on the personality of the employees, but is most decidedly a reflection on your system.

To give proper service to the public and properly maintain your property, your costs for general expense, commercial expense, distribution, etc., would, with the most efficient management, be nearer 18 cents per 1,000 cubic feet than the present figure of 11 cents. It would be natural to expect your lack of expenditure for proper service and maintenance to be reflected more markedly in other departments of your business than is the case. It is shown in a certain extent in your leakage, to a greater extent in the present condition of your supply system, and in the fact that you are facing a large expenditure for extensions and replacements. The effect of your policy is, however, most clearly shown in your service to the consumers and their present attitude.

**Gas Unaccounted For.**

The gas unaccounted for which, from your records and our estimate of consumption, has for the past three years averaged about 17 per cent. should due to probable error in station meter registration, or reduced to 5 per cent. by the use of a better actual leakage of 12 per cent. to 14 per cent. This is still 4 to 8 per cent. higher than it should be.

You have no comprehensive system of repairing main and service pipes and a high leakage would be expected. You cannot, however, assume that all gas unaccounted for escapes from your holders and mains as leakage for with your system, or lack of system, of keeping account of your meters it is more than probable that a number of meters are passing gas to consumers for which the city is receiving no return.

**Income.**

In arriving at the yearly income of your property, an attempt has been made to treat the operation of your gas works as a business enterprise distinct and apart from the municipal government.

In 1897 by resolution of the Council, the use of your property was fixed at \$700,000, which sum there was to be paid 4 per cent. per annum. Since that time there have been other bond issues aggregating \$7,000,000 and bearing the same rate of interest.

In our tables showing the net result of the operation of your gas property, we have included the following items:

First—The actual cost of labor and material as shown by your books and properly chargeable to operating expense.

Second—An item of taxes on the assessed value of your property at the current tax rate. Our reasoning being that in reaching an income derived from any department of the city government, this department should be treated as you would a private enterprise; in other words, entirely separated from the city government.

Third—Your property has been allowed to run down to such an extent that you are now called upon to expend the sum of \$700,000. We estimate on a most conservative basis, that at least \$200,000 of this sum is an expenditure which is properly chargeable against your operations in the past, and should really be distributed over the past ten years at the rate of \$20,000 per year. In our tables for the years 1902, 1903 and 1904, we have entered this charge of \$20,000 against each year's operations.

Fourth—You have during each of the years in question spent certain sums upon extensions. The cost of these extensions was not covered by bond issue, and according to your code cannot be charged to capital account. They are accordingly included in the operating costs.

Fifth—For carrying on your business you utilized a portion of the City Hall. We estimate that your other rental, including heat, lighting, attendance, your legal expense and other such miscellaneous items which are actually paid for out of the city treasury but are not charged to your gas works, would amount to 2-1/2 per cent. of gas sold.

A summary of these various items for the year 1904 would be as follows:

Per M.  
Total cost of labor and materials on basis of sales.....\$542  
Taxes.....\$461  
Depreciation.....\$461  
Interest on bond issues.....\$419  
Disbursements.....\$697  
Miscellaneous expenses, such as office rental, legal expenses, etc.....\$250

Total.....\$958

In other words, these figures it must be borne in mind:

First, That due to the situation of Richmond, you are able to obtain gas coal at \$2.50 per gross ton. Were you obliged to pay \$1 additional for coal your holder cost of coal gas would be increased approximately ten cents per 1,000 cubic feet.

Second, That the wages paid for labor in Richmond should be compared with a great many cities in this country.

Third, That you have not given your consumers proper service. That to increase the efficiency of your service you would have to expend from five cents to seven cents more per 1,000 cubic feet for distribution expenses, etc., than you now spend.

Fourth, That the expenditures of the municipality in the settlement of claims are lower than would be the case with a private corporation.

Fifth, That due to your stringent regulations, which you are in a position to enforce, you are able to collect closer than could a private corporation.

Should we omit all charge for unpaid taxes, depreciation, office rental, etc., we would show an apparent net income of:

1902.....\$17,148.00  
1903.....\$6,350.62  
1904.....\$2,407.79

Quality of Service to the Consumer.

Exhibit "B" gives a comparison between the main system of Richmond and those of two other cities of a comparable size—one (A) located in Massachusetts and one (B) located in New York State.

It will be seen that the 55 miles of street mains in Richmond upwards of 48 per cent. are 3 inches or smaller in size against 8.3 per cent. in the case of "A" and 14.4 per cent. in the case of "B."

A study of this list of mains in connection with the map of the city (Exhibit "B") will convince one that, in order to carry 1-1/2 inches of gas pressure at the lowest point of your system, it will be necessary for you to carry an excessive amount on the higher portions of the system; in fact, a higher pressure than you have available.

A number of pressure charts have, under my direction, been taken at various points on your system. The minimum pressure observed at each point is shown on attached blue-print, marked "Exhibit B." These pressures are in a number of places considerably below the minimum required for labor saving service, and must be borne in mind that these pressures are taken at a time when your consumption is at its lowest point, being probably less than one-half of your maximum. If at the lowest point you obtain in certain localities only about 1-1/2 inch pressure on your mains, with a pressure of 2-1/2 to 3 inches at your works, the surplus foot holder in its present location, which is, of course, fixed being any possibility of change, you will find impracticable to supply the lower sections of the city from this holder without placing on the upper portions an unnecessarily high pressure. This pressure will always mean leakage.

In connection with the supply of gas to this new holder, you have my letter of June 13, 1905, in which I strongly urged that you have a low pressure main arranged to reinforce the pressure on the weaker districts. I understand that you have decided to lay a cast-iron main of 10 inches diameter, and this, although not so large as that suggested in the letter above referred to.

The need of a holder to reinforce the supply of gas to the West End, in my opinion, would not be felt for several years, provided you had ample holder capacity at your lower or upper works, and provided that you had adequate feeder lines.

When such need was felt, a small holder of 50,000 or 60,000 cubic feet capacity, which could be filled during the day time, and used only during the hours of maximum consumption, would fully answer the purpose.

You keep no systematic record of your meter readings being divided by districts and streets. From your records you can trace back the numbers of meters that have been put in a particular district, and the length of time each meter was so located; you cannot, however, discover how long any meter has been in service, how often it has been repaired, nor can you strike a balance of your meters. Such record is of the utmost importance, not only to enable you to periodically overhaul your meters, but for the other reason that, without it, you are unable to detect the loss of meters through the oversight or intent. For instance, if orders are given to set meters in a certain building, and the slip report of this work is lost, you from your records, would not be likely to discover the loss, whereas, with a record which would periodically permit you to check up on the work, you would be in, in, condemned and on hand, you would immediately detect the discrepancy.

It is probable that a certain amount of gas unaccounted for is due to the loss of meters in this district. That such loss is not greater is due only to the honesty of your employees.

Your method of keeping accounts of collected bills, preparing monthly books for the treasurer's office is laborious in the extreme. By introducing more modern methods and by having a competent person to take considerable saving could be effected.

You have heretofore kept no record of complaints except for a period of a few days after the complaint was made, and the order of the deficiencies in the service in the various parts of your city.

You make no effort to promote the use of your gas in the heating, nor, in fact, for lighting. According to your reports, there are a considerable number of heating and cooking appliances in the city which are not used, no steps are taken by you to follow up the sale of an appliance to see that the purchaser is satisfied and understands its use.

Your method of purchasing supplies in small quantities is not economical. With a large quantity of supplies you could periodically order supplies in large quantities and obtain reduced prices. You could also manufacture your own purifiers and gas pressure regulators, thus saving the price for which you pay for this material.

There is also an entire lack of system in keeping account of the disposition of material purchased under your expense account.

There is great need of complete detail reports of your operations to be made from month to month; in fact, without such reports and unless your disbursements are carefully kept, it is impossible to obtain the best results.

At your lower works the various apparatus is operated according to the best of your knowledge and ability, and under charge, unassisted by definite instructions. The records which are kept at these works, as far as they go, were found to be of little value in the present respect. The information contained in them is not, however, properly applied; for instance, the reports of the amount of various materials used for 1,000 cubic feet, but the causes of these variations are not investigated, and the results are not used according to your reports, you are under your benches only 15 pounds of coke per 10 pounds of coal carbonized, whereas, if it was practicable to maintain the heats in the benches with the use of only 10 pounds of coke at certain times, you would naturally expect your management would make some effort to keep the consumption at this point, or find out the reason for an increase in coke consumption.

This same lack of systematic direction is noticed in every department of your business, through gross negligence, permit the pressure on your mains to drop as low as 17, and your management, in so doing, is not only neglecting the interests of your works or main system; without such maps of the city, it is impossible for your management to determine the causes of complaints in various districts; moreover, your maps are distinctly orders that such maps be on file.

RECOMMENDATIONS  
That you use every endeavor to have the new 2,000 cubic foot holder and pumping line completed and in use at an early date.

This is of the utmost importance, as your services will, during the coming winter, without this holder, be in a state of accident to any of your present holders, the supply of a large district would cease entirely.

That you make improvements and extensions to your present works, as outlined in Exhibit "B," heretofore should be first installed; this will give you sufficient manufacturing capacity to meet the demand for your gas during the winter months, and will also permit the completion of this water gas plant, by the

Our cook book "Culinary Winkles" mailed free.

**Armour's Extract of Beef**

may be served in soups, gravies, etc., at the cost to each person of about one cent a meal.

A penny that earns big health dividends.

Armour & Company, Chicago

**Best American Granulated Sugar** 43c

American Sardines, nine cans.....25c  
Fresh Canned Hams, per pound.....9c  
New Navy Beans, per quart.....7c  
Silver King Best Flour, sold 30c bag, or barrel.....\$4.75

Fresh French Candy, per pound.....5c  
2 pounds Fresh Roasted Laguyra Coffee for.....25c  
Best California Hams, per pound.....8 1/2c  
Grape Nuts or Postum, package.....12c  
Mountain Roll Butter, 2 pounds for.....25c

Evaporated Peaches, per pound.....11c  
Good Salt Pork per pound.....6 1/2c  
2 Chalmers Gelatine for.....15c

New Sourkruit, per quart.....5c  
Good Roll Butter, per pound.....15c

**S. Ullman's Sons**

Main Street Stores, 1820-1822 East Main Street; Marshall Street Store, 500 East Marshall Street. 'Phones at our Two Stores.

West End. In order to obtain as little difference between the maximum and minimum pressures in a gas distributing system, the distributing points, or holder stations, should be placed on the lowest ground available, the reason for this being, if at the lowest point of the pipes, to a greater or less extent, be counterbalanced by the pressure increase due to differences in elevation. This change in the surplus foot holder in its present location, which is, of course, fixed being any possibility of change, you will find impracticable to supply the lower sections of the city from this holder without placing on the upper portions an unnecessarily high pressure. This pressure will always mean leakage.

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This is of the utmost importance, as your services will, during the coming winter, without this holder, be in a state of accident to any of your present holders, the supply of a large district would cease entirely.

That you make improvements and extensions to your present works, as outlined in Exhibit "B," heretofore should be first installed; this will give you sufficient manufacturing capacity to meet the demand for your gas during the winter months, and will also permit the completion of this water gas plant, by the

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A penny that earns big health dividends.

Armour & Company, Chicago

connections to the present 400,000 cubic foot holder should be put in, and the holder rebuilt, as outlined in Exhibit "G." The remainder of improvements, consisting of changes in connections, installing of scrubbing, condensing and purifying plant, etc., should go forward at the same time that your benches are being built.

After the completion of the new holder and after the present 400,000 cubic foot holder has been rebuilt, it would be recommended that you entirely abandon your present works as a distributing station. The holders are in such bad condition as to be not worth repairing, and, moreover, the maintenance costs you from \$3,000 to \$5,000 per year.

Mains. That you lay mains as per exhibit "G," attached hereto. This exhibit provides for the laying of fifteen inches of pipe, largely 6 inches and 8 inches in diameter to replace the present 3-inch pipes. You may urge that this work can be postponed, and so in fact it can, but your system will never be what it should be until these 3-inch mains are replaced by larger pipes.

Ultimately you will find it necessary to relay more than the fifteen miles, which are now recommended. Your main system should be put in such condition that you have not less than 15 inches of pressure at any portion of your system, and this pressure should be maintained without having an excessive amount on any other portion.

At our examination of your main system had to be undertaken during the time of minimum consumption and the conditions also were found to be entirely changed after the completion of the new holder. It has been extremely difficult to determine just what large mains should be laid. Due to these conditions, my recommendation that you lay mains 10-inch and larger as shown on exhibit "G," has been worked out in the most conservative manner, and in all probability you will, after the new holder has been in service for some time, find it necessary to lay more of the larger mains than are now recommended. During the coming winter a careful study should be made of your main system, and pressures should be taken to determine the weakest districts.

Services. That you lay no service smaller than one and a quarter inches, and that all service pipe be coated with a preservative before being put in the trench, and further when it is found necessary to repair a service smaller than the above, that the same be replaced with a pipe of the same size, and with a new joint. Eighteen months you will, in extensions and replacements, lay two thousand services.

Metres. That all metres on your system be systematically removed, tested and repaired, at least once in three to five years. For testing a prover should be used in place of the present test cocks, and it is estimated that to provide for extensions and to replace metres now in service, which will be found worn out, you will require at the next two months 3,000 metres, none of which should be smaller than five light.

Quality of Gas. That you make twenty grains of sulphur per 100 cubic feet, and five grains of ammonia per 100 cubic feet, the maximum amount of these impurities to be contained in the gas distributed.

That you distribute a mixed gas of water gas and coal gas, and that you purchase and install the necessary bar photometer and laboratory apparatus to enable your superintendent to uniformly carry out these regulations.

Operations. Heretofore it has cost you less per 1,000 cubic feet to manufacture water gas than to manufacture coal gas. By the installation of modern and efficient gas apparatus, the cost of coal gas should be the cheaper of the two gases. As gas can be purchased in Richmond for \$2.50 per gross ton, and the domestic size of anthracite coal retail for \$5.50 to \$7.00 per net ton, you should be able to develop a good market in Richmond for the sale of coke for domestic purposes. You would recommend that you manufacture as much coal gas as practicable, at the same time disposing of your coke and utilizing the proper candle power. In other words, that you manufacture water gas for maintaining the candle power, for taking up the irregularities in your consumption and for controlling the market for coke. I would also suggest that you use a cheaper grade of oil in the water gas manufacture.

By making the improvements herein suggested, you will, with efficient management, be able to deliver gas to the consumer at a lower cost than you are now doing, and at the same time maintaining your property in the proper condition, for less than the cost of the present candle power. In other words, that you manufacture water gas for maintaining the candle power, for taking up the irregularities in your consumption and for controlling the market for coke. I would also suggest that you use a cheaper grade of oil in the water gas manufacture.

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